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- ART. IV.—1. *Social Statics: or the Conditions essential to Human Happiness specified, and the First of them developed.* By HERBERT SPENCER. London: John Chapman. 1851. 8vo. pp. 476.
2. *The Principles of Psychology.* By HERBERT SPENCER. London: Longman, Brown, Green, and Longmans. 1855. 8vo. pp. 620.
3. *Education, Intellectual, Moral, and Physical.* By HERBERT SPENCER. New York: D. Appleton & Co. 1865. 12mo. pp. 283.
4. *Illustrations of Universal Progress; a Series of Discussions.* By HERBERT SPENCER. New York: D. Appleton & Co. 1864. 12mo. pp. xxiv., 470.
5. *First Principles of a New System of Philosophy.* By HERBERT SPENCER. New York: D. Appleton & Co. 1864. 12mo. pp. 503.
6. *The Classification of the Sciences; to which are added Reasons for Dissenting from the Philosophy of M. Comte.* By HERBERT SPENCER. New York: D. Appleton & Co. 1864. 8vo. pp. 48.
7. *Essays, Moral, Political, and Æsthetic.* By HERBERT SPENCER. New York: D. Appleton & Co. 1864. 12mo. pp. 386.
8. *Principles of Biology.* By HERBERT SPENCER. In Quarterly Parts, by Subscription. New York: D. Appleton & Co.

WHY the inductive and mathematical sciences, after their first rapid development at the culmination of Greek civilization, advanced so slowly for two thousand years, — and why in the following two hundred years a knowledge of natural and mathematical science has accumulated, which so vastly exceeds all that was previously known that these sciences may be justly regarded as the products of our own times, — are questions which have interested the modern philosopher not less than the objects with which these sciences are more immediately conversant. Was it in the employment of a new method of research, or in the exercise of greater virtue in the use of old

methods, that this singular modern phenomenon had its origin? Was the long period one of arrested development, and is the modern era one of a normal growth? or should we ascribe the characteristics of both periods to inexplicable historical accidents, — to the influence of conjunctions in circumstances of which no explanation is possible, save in the omnipotence and wisdom of a guiding Providence?

The explanation which has become commonplace, that the ancients employed deduction chiefly in their scientific inquiries, while the moderns employ induction, proves to be too narrow, and fails upon close examination to point with sufficient distinctness the contrast that is evident between ancient and modern scientific doctrines and inquiries. For all knowledge is founded on observation, and proceeds from this by analysis and synthesis, by synthesis and analysis, by induction and deduction, and if possible by verification, or by new appeals to observation under the guidance of deduction, — by steps which are indeed correlative parts of one method; and the ancient sciences afford examples of every one of these methods, or parts of the one complete method, which have been generalized from the examples of science.

A failure to employ or to employ adequately any one of these partial methods, an imperfection in the arts and resources of observation and experiment, carelessness in observation, neglect of relevant facts, vagueness and carelessness in reasoning, and the failure to draw the consequences of theory and test them by appeal to experiment and observation, — these are the faults which cause all failures to ascertain truth, whether among the ancients or the moderns; but they do not explain why the modern is possessed of a greater virtue, and by what means he attained to his superiority. Much less do they explain the sudden growth of science in recent times.

The attempt to discover the explanation of this phenomenon in the antithesis of “facts” and “theories” or “facts” and “ideas,” — in the neglect among the ancients of the former, and their too exclusive attention to the latter, — proves also to be too narrow, as well as open to the charge of vagueness. For, in the first place, the antithesis is not complete. Facts and theories are not co-ordinate species. Theories, if true, are facts, —

a particular class of facts indeed, generally complex ones, but still facts. Facts, on the other hand, even in the narrowest signification of the word, if they be at all complex, and if a logical connection subsists between their constituents, have all the positive attributes of theories.

Nevertheless, this distinction, however inadequate it may be to explain the source of true method in science, is well founded, and connotes an important character in true method. A fact is a proposition of which the verification by an appeal to the primary sources of our knowledge or to experience is direct and simple. A theory, on the other hand, if true, has all the characteristics of a fact, except that its verification is possible only by indirect, remote, and difficult means. To convert theories into facts is to add *simple verification*, and the theory thus acquires the full characteristics of a fact. When Pascal caused the Torricellian tube to be carried up the Puy de Dôme, and thus showed that the mercurial column was sustained by the weight of the atmosphere, he brought the theory of atmospheric pressure nearly down to the level of a fact of observation. But even in this most remarkable instance of scientific discovery theory was not wholly reduced to fact, since the verification, though easy, was not entirely simple, and was incomplete until further observations showed that the quantity of the fall in the Torricellian tube agreed with deductions from the combined theories of atmospherical pressure and elasticity. In the same way the theory of universal gravitation fails to become a fact in the proper sense of this word, however complete its verification, because this verification is not simple and direct, or through the spontaneous activity of our perceptive powers.

Modern science deals then no less with theories than with facts, but always as much as possible with the verification of theories,—if not to make them facts by *simple* verification through experiment and observation, at least to prove their truth by indirect verification.

The distinction of fact and theory thus yields an important principle, of which M. Comte and his followers have made much account. It is in the employment of verification, they say, and in the possibility of it, that the superiority of modern inductive research consists; and it is because the ancients did

not, or could not, verify their theories, that they made such insignificant progress in science. It is indisputable that verification is essential to the completeness of scientific method ; but there is still room for debate as to what constitutes verification in the various departments of philosophical inquiry. So long as the philosophy of method fails to give a complete inventory of our primary sources of knowledge, and cannot decide authoritatively what are the origins of first truths, or the truths of observation, so long will it remain uncertain what is a legitimate appeal to observation, or what is a real verification. The Platonists or the rationalists may equally with the empiricists claim verification for their theories ; for do they not appeal to the reason for confirmation of deductions from their theories, which they regard as founded on observation of what the reason reveals to them ?

The positivists' principle of verification comes, then, only to this, — that, inasmuch as mankind are nearly unanimous about the testimony and trustworthiness of their senses, but are divided about the validity of all other kinds of authority, which they in a word call the reason, or internal sense, therefore verification by the senses produces absolute conviction, while verification by the reason settles nothing, but is liable to the same uncertainty which attends the primary appeals to this authority for the data of speculative knowledge.

But not only does the so-called metaphysical philosophy employ a species of verification by appealing to the testimony of reason, consciousness, or internal sense ; but the ancient physical sciences afford examples of the confirmation of theory by observation proper. The Ptolemaic system of astronomy was an instance of the employment of every one of the partial steps of true method ; and the theory of epicycles not only sought to represent the facts of observation, but also by the prediction of astronomical phenomena to verify the truth of its representation. Modern astronomy does not proceed otherwise, except that its theories represent a much greater number of facts of observation, and are confirmed by much more efficient experimental tests.

The difference, then, between ancient and modern science is not truly characterized by any of the several explanations

which have been proposed. The explanation which, in our opinion, comes nearer to the true solution, and yet fails to designate the real point of difference, is that which the positivists find in the distinction between "objective method" and "subjective method." The objective method is verification by sensuous tests, tests of sensible experience, — a deduction from theory of consequences, of which we may have sensible experiences if they be true. The subjective method, on the other hand, appeals to the tests of internal evidence, tests of reason, and the data of self-consciousness; authorities on which, as the history of philosophy shows, there is little unanimity among philosophers. But whatever be the origin of the theories of science, whether from a systematic examination of empirical facts by conscious induction, or from the natural biases of the mind, the so called intuitions of reason, what seems probable without a distinct survey of our experiences, — whatever the origin, real or ideal, the *value* of these theories can only be tested, say the positivists, by an appeal to sensible experience, by deductions from them of consequences which we can confirm by the undoubted testimony of the senses. Thus, while ideal or transcendental elements are admitted into scientific researches, though in themselves insusceptible of simple verification, they must still show credentials from the senses, either by affording from themselves consequences capable of sensuous verification, or by yielding such consequences in conjunction with ideas which by themselves are verifiable.

It is undoubtedly true, that one of the leading traits of modern scientific research is this reduction of ideas to the tests of experience. The systematic development of ideas through induction from the first and simplest facts of observation, is by no means so obvious a characteristic. Inductions are still performed for the most part unconsciously and unsystematically. Ideas are developed by the sagacity of the expert, rather than by the systematic procedures of the philosopher. But when and however ideas are developed science cares nothing, for it is only by subsequent tests of sensible experience that ideas are admitted into the pandects of science.

It is of no consequence to scientific astronomy whence the theory of gravitation arose; whether as an induction from the

theories of attractions and the law of radiations, or from the rational simplicity of this law itself, as the most natural supposition which could be made. Science asks no questions about the ontological pedigree or *a priori* character of a theory, but is content to judge it by its performance ; and it is thus that a knowledge of nature, having all the certainty which the senses are competent to inspire, has been attained,—a knowledge which maintains a strict neutrality toward all philosophical systems, and concerns itself not at all with the genesis or *a priori* grounds of ideas.

This mode of philosophizing is not, however, exclusively found in modern scientific research. Ptolemy claimed for his epicycles only that “they saved the appearances” ; and he might have said, with as much propriety as Newton, “*Hypotheses non fingo*,” for it was the aim of his research to represent abstractly, and by the most general formulas, the characteristics of the movements of the planets, — an aim which modern astronomy, with a much simpler hypothesis, and with immensely increased facilities, still pursues.

We find, therefore, that while moderns follow a true method of investigation with greater facilities and greater fidelity than the ancients, and with a clearer apprehension of its elements and conditions, yet that no new discoveries in method have been made, and no general sources of truth have been pointed out, which were not patent and known to the ancients ; and we have so far failed to discover any solution to the problem with which we began. We have seen that it was not by the employment of a new method of research, but in the exercise of greater virtue in the use of old methods, that modern scientific researches have succeeded. But whence this greater virtue ? What vivifying, energizing influence awakened the sixteenth century to the movement, which has continued down to the present day to engross, and even to create, the energies of philosophic thought in the study of natural phenomena ? Obviously some interest was awakened, which had before been powerless, or had influenced only men of rare and extraordinary genius, or else some opposing interest had ceased to exercise a preponderating influence.

We have now arrived at a new order of inquiries. We ask

no longer what are the differences of *method* between ancient and modern scientific researches, but we seek the difference in the *motives* which actuated the philosophic inquiries of the two periods. We seek for the interests which in modern times have so powerfully drawn men of all orders of intelligence to the pursuit of science, and to an observance of the conditions requisite for its successful prosecution. This inquiry will, we think, lead to more profitable conclusions than the course we have pursued in review of the theories which have been put forward on this subject. But we have little space in these introductory pages to develop this aspect of the history of science, or to do more than indicate the conclusions we have reached in the classification and history of the dominant motives and the sources of the questions which have determined and directed the pursuit of science. We ask no longer what course has led to successful answers in science, but what motives have prompted the pertinent questions.

In place of the positivists' phraseology, that the ancients followed "the subjective method," or appealed for the verification of their theories to natural beliefs, while the moderns follow "the objective method," or appeal to new and independent experimental evidence,—if we substitute the word "motive" for "method," we have the terms of one of the conclusions on which we wish to insist. But these require explanation.

By a subjective motive we mean one having its origin in natural universal human interests and emotions, which existed before philosophy was born, which continue to exist in the maturity of philosophy, and determine the character of an important and by no means defunct order of human speculations. By an objective motive we mean one having an empirical origin, arising in the course of an inquiry; springing from interests which are defined by what we already know, and not by what we have always felt,—interests which depend on acquired knowledge, and not on natural desires and emotions. Among the latter we must include the natural desire for knowledge, or the primitive, undisciplined sentiment of curiosity. An objective motive is what this becomes when it ceases to be associated with our fears, our respects, our aspirations,—our emotional nature; when it ceases to prompt ques-

tions as to what relates to our personal destiny, our ambitions, our moral worth; when it ceases to have man, his personal and social nature, as its central and controlling objects. A curiosity which is determined chiefly or solely by the felt imperfections of knowledge as such, and without reference to the uses this knowledge may subserve, is prompted by what we call an objective motive.

A spirit of inquiry which is freed from the influence of our active powers, and the interests that gave birth to theological and metaphysical philosophies, — which yields passively and easily to the direction of objective motives, to the felt imperfections of knowledge as such, — is necessarily, at all times, a weak feeling; and before a body of systematic, well-digested, and well-ascertained scientific truth had been generated, could hardly have had any persistent influence on the direction of inquiry.

The motives to theological and metaphysical speculation exist from the beginning of civilized human life in the active emotional nature of man. Curiosity as a love of the marvellous, or as a love of facts, — new facts, prized because they are new and stimulating, — also dates back of civilized life. These motives find play in human nature, as it emerges from a semi-animal state; but they also persist and determine the growth of the human mind in its most advanced development.

The questions of philosophy proper are human desires and fears and aspirations — human emotions — taking an intellectual form. Science follows, but does not supersede, this philosophy. The three phases which the positivists assign to the development of the human mind — the Theological, the Metaphysical, and the Positive or Scientific — are not in reality successive, except in their beginnings. They coexist in all the highest developments of civilization and mental activity. They coexisted in the golden age of Greek civilization, in the intense mental activity of the Middle Ages. They move on together in this marvellous modern era. But until this latest epoch positive science was always the inferior philosophy, — hardly a distinct philosophy at all, — not yet born. But at the beginning of the modern era its gestation was completed. A body of knowledge existed, sufficiently extensive, coherent, and

varied, to bear within it a life of its own, — an independent life, — which was able to collect to itself, by its own determinations, the materials of a continued, new, and ever-increasing mental activity, — an activity determined solely by an objective curiosity, or by curiosity in its purest, fullest, and highest energy.

We are probably indebted to the few men of scientific genius who lived during the slow advancement of modern civilization for the foundation of this culture, — for the accumulation of the knowledge requisite for this subsequent growth. These men were doubtless, for the most part, the products of their own times and civilization, as indeed all great men have been, but still originators, by concentrating and making productive the energies, tendencies, and knowledges which, but for them, would have remained inert and unfruitful. It is to such men, born at long intervals in the slow progress of civilization, each carrying forward a little the work of his predecessor, that we probably owe our modern science, rather than to the influence of any single mind, like Bacon, who was, like his predecessors, but the lens which collected the light of his times, — who prophesied rather than inaugurated the new era. And we owe science to the combined energies of individual men of genius, rather than to any tendency to progress inherent in civilization.

We find, then, the explanation of the modern development of science in the accumulation of a body of certified knowledge, sufficiently extensive to engage and discipline a rational scientific curiosity, and stimulate it to act independently of other philosophical motives. It is doubtless true, that other motives have influenced this development, and especially that motives of material utility have had a powerful effect in stimulating inquiry. Ancient schools of philosophy despised narrow material utilities, the servile arts, and sought no instruction in what moderns dignify by the name of useful arts ; but modern science finds in the requirements of the material arts the safest guide to exact knowledge. A theory which is utilized receives the highest possible certificate of truth. Navigation by the aid of astronomical tables, the magnetic telegraph, the innumerable utilities of mechanical and chemical science, are constant

and perfect tests of scientific theories, and afford the standard of certitude, which science has been able to apply so extensively in its interpretations of natural phenomena.

But the motives proper to science, though purified by their dissociation from the subjective determinations and tendencies, which gave an anthropomorphic and teleological character to ancient views of nature, are not the only legitimate motives to philosophical inquiry. There is another curiosity purified by its association with the nobler sentiments, — with wonder, admiration, veneration, — and with the interests of our moral and æsthetical natures. This curiosity is the motive to philosophy proper. “Wonder is a highly philosophical affection,” says Plato’s Socrates; “indeed, there is no other principle of philosophy but this.”

Curiosity determined by natural sentiments and emotions — subjective curiosity — is the cause of a culture coextensive with civilization, long preceding the growth of science, and constituting all that is peculiar to civilized life except the material arts. However meanly the conclusions of theological and metaphysical speculations may appear, when tried by the objective standard of science, they too have their superiorities, by the test of which science becomes in turn insignificant. Unverified conclusions, vague ideas, crude fancies, they may be, but the products they certainly are of activities which constitute more of human happiness and human worth than the narrow material standards of science have been able to measure.

Philosophy proper should be classed with the Religions and with the Fine Arts, and estimated rather by the dignity of its motives, and the value it directs us to, than by the value of its own attainments. To condemn this pursuit because it fails to accomplish what science does, would be to condemn that which has formed in human nature habits, ideas, and associations on which all that is best in us depends, — would warrant the condemnation of science itself, since science scarcely existed at all for two thousand years of civilization, and represented as a distinct department during this period only the interests of the servile arts. The objects of Philosophy were those which the religious ideas and emotions of man presented to his speculative curiosity. These, though motives proper to Philosophy,

also gave direction to inquiries in Physics and Astronomy. The Fine Arts sprang from the same interests, and persisted through the conservative power of religious interests in a development to which the modern world offers no parallel. We have no styles in Art, no persistently pursued efforts for perfection in beauty, because we are not held to the conditions of this perfection by the religious motives which directed ancient Art. The growth of Theology and Metaphysics is less vigorous now for the same reason. Theology was Philosophy developed in the interests of Religion or of religious feeling, and Metaphysics was cultivated in the interest of Theology. Both aimed at truth; both were determined by the same love of simplicity and unity in knowledge, which determines all search after truth; but neither cared for simple truth alone. When pursued for the truth of fact alone, they both degenerate into affectation and emptiness. We do not omit the sceptical philosophies of antiquity from this description, because they were not held independently of the religious interests of the orthodox philosophy, but in opposition to them or in criticism of them.

Theology and Metaphysics failed to apply a correct method and to arrive at certain results, not because philosophers were ignorant of method, but because the object-matters of their research were not questions of sensible experience, — were not mere questions of facts of which the mind is the passive recipient through the senses. Their aim was to *prove* truth, not to discover it, — to reduce opinions and ideas which had the warrant of religious associations to the simplicity and consistency of truth; and when ideas and opinions have this warrant, it does not require the verification of the senses to make the conclusions of Philosophy acceptable and true to the religious instincts. To educe conclusions acceptable to these instincts and in opposition to no known truth, — in other words, to free religious beliefs from contradictions and to give them consistency, — was the aspiration and the devoted service of Philosophy.

Philosophy has in fact three phases instead of two. For as Theology was a speculation prosecuted in the interest of religious feeling, and Metaphysics a speculation in defence or criticism of the doctrines of Theology, so Criticism or Critical Philosophy is an examination of metaphysical conclusions.

But the latter is properly, in its motives, a scientific speculation. Such is the true logical order of Philosophy proper, though all these phases may and do coexist in history.

It is the opinion of many modern thinkers, besides the so-called Positivists, or avowed followers of M. Comte, that science, as we have defined it, or truth pursued simply in the interests of a rational curiosity, and for the mental discipline and the material utilities of its processes and conclusions, will hereafter occupy more and more the attention of mankind, to the exclusion of the older philosophy. It is also the opinion of these thinkers, that this is not to be regretted, but rather welcomed as a step forward in the advancement of human welfare and civilization; that the pursuit of science and its utilities is capable of inspiring as great and earnest a devotion as those which religious interests have inspired, and which have hitherto determined the destinies of mankind and given form to human thought, and one vastly more beneficent.

Whatever foundations there are for these opinions, it is certain that the claims of science, as a new power in the world, to the regard of thoughtful and earnest men, are receiving a renewed and more candid attention. Through its recent progress, many of the questions which have hitherto remained in the arena of metaphysical disputation are brought forward in new forms and under new auspices. Scientific investigations promise to throw a flood of light on subjects which have interested mankind since the beginning of speculation,—subjects related to universal human interests. History, society, laws, and morality,—all are claimed as topics with which scientific methods are competent to deal. Scientific solutions are proposed to all the questions of philosophy which scientific illumination may not show to have their origin in metaphysical hallucination.

Prominent in the ranks of the new school stands Mr. Herbert Spencer, whose versatility has already given to the world many ingenious and original essays in this new philosophy, and whose aspiring genius projects many more, which, if his strength does not fail, are to develop the capacities of a scientific method in dealing with all the problems that ought legitimately to interest the human mind.

The programme of his future labors which his publishers have advertised might dispose a prejudiced critic to look with suspicion on what he has already accomplished; but the favorable impression which his works have made, and the plaudits of an admiring public, demand a suspension of judgment; and the extravagance of his pretensions should for the present be credited to the strength of his enthusiasm.

It is through the past labors of an author that we must judge of his qualifications for future work, and the completeness of his preparation. Mr. Spencer's writings evince an extensive knowledge of facts political and scientific, but extensive rather than profound, and all at second hand. It is not, of course, to be expected that a philosopher will be an original investigator in all the departments of knowledge with which he is obliged to have dealings. He must take much at second hand. But original investigations in some department of empirical science are a discipline which best tests and develops even a philosopher's powers. He has in this at least an experience of what is requisite to an adequate comprehension of facts. He learns how to make knowledge profitable to the ascertainment of new truths, — an art in which the modern natural philosopher excels. By new truths must be understood such as are not implied in what we already know, or educible from what is patent to common observation. However skilfully the philosopher may apply his analytical processes to the abstraction of the truths involved in patent facts, the utility of his results will depend not so much on their value and extent as mere abstractions, as on their capacity to enlarge our experience by bringing to notice residual phenomena, and making us observe what we have entirely overlooked, or search out what has eluded our observation. Such is the character of the principles of modern natural philosophy, both mathematical and physical. They are rather the eyes with which nature is seen, than the elements and constituents of the objects discovered. It was in a clear apprehension of this value in the principles of mathematical and experimental science, that the excellence of Newton's genius consisted; and it is this value which the Positive Philosophy most prizes. But this is not the value which we find in Mr. Spencer's speculations.

Mr. Spencer is not a positivist, though that was not a very culpable mistake which confounded his speculations with the writings of this school. For however much he differs from the positivists in his methods and opinions, he is actuated by the same confidence in the capacities of a scientific method, and by the same disrespect for the older philosophies. Mr. Spencer applies a method for the ascertainment of ultimate truths, which a positivist would regard as correct only on the supposition that the materials of truth have all been collected, and that the research of science is no longer for the enlargement of our experience or for the informing of the mind. Until these conditions be realized, the positivist regards such attempts as Mr. Spencer's as not only faulty, but positively pernicious and misleading. Nothing justifies the development of abstract principles in science but their utility in enlarging our concrete knowledge of nature. The ideas on which mathematical Mechanics and the Calculus are founded, the morphological ideas of Natural History, and the theories of Chemistry are such working ideas, — finders, not merely summaries of truth.

But before examining more in detail Mr. Spencer's method of philosophizing, it will be useful to consider his career and character as a thinker and writer. Born in Derby in 1820, he was educated by his father, who was a school-teacher in that town, and by his uncle, a clergyman of the Established Church. At the age of seventeen he entered on the profession of civil engineering, which he followed for eight years. He then abandoned this pursuit for a literary career. He had already published in a scientific journal several papers on professional subjects, and at the age of twenty-two gave an earnest of his tastes for political speculation in a newspaper article on "The Proper Sphere of Government." He afterwards became a writer in the *Economist*, and in 1851 published his "Social Statics, or the Conditions essential to Human Happiness specified, and the First of them developed." By this work he became first generally known to the reading public in America. This work exhibits the traits which characterize all Mr. Spencer's subsequent writings. A constant and close student of facts both political and scientific, with the practical bent of the English radical and idealist, he is none the less strongly attracted to the abstrac-

tions of speculative thought. He aims at the same time at system and at effect. No distract idealist, though always actuated by that discontent which moves revolutions and reforms, he uses abstractions and abstract modes of thought for moral ends. His allegiance to his speculative and his practical aims seems sometimes divided, and then he shows a tendency to follow out the consequences of theory, and to trust the welfare of mankind to its omnipotent care. He has great faith in the self-sufficingness of things. The very elements have in them the seeds of moral perfectibility. But he would leave out of the category of natural agencies in politics the paternal care of the rulers of mankind. He regards with lofty scorn that presumption in the governing classes which pretends to comprehend and help forward the inherent progressiveness of the world. Moral idealism colors all Mr. Spencer's views, both in science and politics. This gains him a popular hearing, especially with the youth of democratic America. But American democracy itself sympathizes with English radicalism only as the rich and benevolent sympathize with the poor. We wish them the good of universal suffrage. We are studying how to remedy the evils of it. To us this boon is a present fate, mixed of good and evil, — a thing neither to seek nor to avoid, but of which we must make the best. We suffer our legislators to exercise that absolute tyranny which Mr. Spencer proves to be an absolute immorality, — a compulsory universal common-school education, — without a murmur. We have not even suspected its immorality. Some of us regard it as a little overdone; but few or none have found that the system is radically faulty, though it be at variance with Mr. Spencer's moral premises. But we must defer the consideration of the arguments of this work, for we are at present only concerned with the characteristics of the writer.

The strong tendency to speculative and abstract modes of thought which this work evinces found a more distinct utterance in the author's "*Principles of Psychology*," published four years later, in 1855. The choice of this subject seems to have been determined by the author's genius for the kind of thinking to which this subject is adapted, rather than by any special training in its literature. Indeed, this work, like the

"Social Statics," is characterized by great originality. Constrained by his entire sympathy with modern movements in thought and scientific culture, he is perforce a scientific empiricist, though his peculiar genius would have found a more congenial employment in scholastic philosophy. Mr. Spencer believes in developments. All his writings are developments, and most of them are about developments. He delights in "evolutions from the homogeneous to the heterogeneous," — in "changes from an indefinite incoherent homogeneity to a definite coherent heterogeneity, through continuous differentiations and integrations." He not only discovers them in all the objects of scientific research, but he rings these changes in all his discourses on them. Analysis is his *forte*, and developments are foibles. But he had not yet in his "Principles of Psychology" fully developed these foibles. He finds, however, in the problems of Psychology scope for his analytical powers. Like all writers who do not speak from the urgency of conviction or dissent, he is an eclectic. He aims to combine in his Psychology what is true in empiricism with what is true in metaphysics; and he had special reasons for this course. Mr. Spencer is here no longer a champion. His moral convictions find their utterance in his political and social essays. In Philosophy he is charmed with ideas, and with his power to unravel them. He is actuated by a simple love of truth, and he is therefore an eclectic. He has no real respect for ideas or for the religious grounds of metaphysics. As between pure empiricism and religious metaphysics his choice would be unhesitating. He would choose empiricism. But ideas are fine things when one has more power to unfold than to find them, and they are still found, as heretofore, by the insights of scientific sagacity rather than by any method. Pure empiricism, however, or Positivism, refuses to Psychology any place in the hierarchy of the sciences. How then can Mr. Spencer get the ideas on which to exercise his powers? There is only one course; he must postulate them. Ideas are all derived from experience, it is true; but we must not seek in actual particular experiences for their validity. These may be, and probably are, beyond the reach of resuscitation. What then is the test of truth or of reality in the grounds of any idea? "The incon-

ceivableness of its negation," says Mr. Spencer; and so he adopted a principle from metaphysics, but with a limitation. This inconceivableness results from the discipline of experience. It does not depend on any plastic power of the mind as an original nature, determining the possibilities of experience and thought, but it is determined in the mind by invariable experiences. Those orders and relationships of events in nature which are present to the mind from its first determinations to thought, which are never contradicted in experience, determine also the possibilities of thought; and in turn the possibilities of thought are tests of invariable experiences, though the particular experiences are lost in oblivion. In other words, the mind has but one faculty peculiarly its own, and that is memory. The mind is pure memory, but this has various forms. The primordial memory, the intellect, that which is as it were the framework of all the others, — the containing memory, — consists of certain beliefs, the negations of which cannot be conceived, but the particular grounds of which are forgotten. This memory extends back of the individual life, is derived from the experience of the race, and constitutes the innate tendencies and mental powers with which the individual life begins. This sounds like Plato's doctrine, that learning is a kind of reminiscence; but it is in fact pure empiricism. Mind is but a reflex of organism. But the organism has a memory, — a memory of the results of all invariable experiences in the continuous evolutions of the race. No empiricist can find any radical fault in this account of innate ideas.

But Mr. Spencer evolves it in a somewhat different manner. He is seeking for a basis of psychology which shall be consistent with the truth of empiricism, and at the same time with the possibility of psychology as a distinct science. Some first truth or truths peculiarly psychological are wanted, for Mr. Spencer proposes to try his speculative powers in eliciting what has eluded the sagacity of his predecessors in psychology, — in the analysis of ideas. Now, the existence of beliefs, proved to be invariable by the inconceivableness of their negations, is a fundamental fact of consciousness, — the most fundamental fact. Beliefs of all sorts are the constituent elements of consciousness. Every act of the mind involves a judgment, that

is, a belief; and the only test, indeed the only meaning, of the *truth* of a belief is its *persistency*. Hence invariableness in a belief, as proved by the inconceivableness of its negation, is the highest possible warrant of truth. Sensible experience can give us no higher warrant. The mind, therefore, contains in itself the criterion of truth; and psychology, or a scientific evolution of the data of consciousness, is a legitimate philosophy. And this is thought to be not inconsistent with the empirical explanation of the origin of invariable beliefs, namely, the formation of the mind by invariable, often repeated, special experiences, both in the individual and in the race. But there is a superfluity somewhere,—too many authorities. Occam's razor is not too old to apply to this new philosophy. The characteristic common to particular, real experiences, and to universal, necessary truths, so called,—namely, that they are believed, and believed without appeal to anything else,—this characteristic is either from the same or from different sources. If from different sources, then empiricism is false, and Psychology is a legitimate philosophy. If from the same source, namely, particular experiences, then these are a sufficient authority, and indeed the only *final* appeal, though invariable beliefs, “proved to be invariable by the inconceivableness of their negations,” may be excellent approximate determinations of what experience certifies. No empiricist will deny this excellence to natural beliefs, but this is not ascribing to them any proper authority.

In discussing this his criterion or “universal postulate,” Mr. Spencer encounters two of the acutest of modern thinkers, Mr. Mill and Sir William Hamilton, whose opinions he finds opposed to his own on opposite grounds. Here is a fine chance for eclecticism, to combine what is true in both these philosophies; but first he must refute what is false.

Speaking of the effect of habit in determining the limits of our conceptive faculty, Mr. Mill says: “There are remarkable instances of this in the history of science; instances in which the wisest men rejected as impossible, because inconceivable, things which their posterity, by earlier practice and longer perseverance in the attempt, found it quite easy to conceive, and which everybody now knows to be true.” While

granting that this evidence is sufficient to disprove the doctrine of the *a priori* character of our natural beliefs, our author thinks that "it does not really warrant Mr. Mill's inference, that it is absurd to reject a proposition as impossible on no other grounds than its inconceivableness." Further on he says: —

"If there be, as Mr. Mill holds, certain absolute uniformities in nature; if these uniformities produce, as they must, absolute uniformities in our experience; and if, as he shows, these absolute uniformities in our experience disable us from conceiving the negations of them, — then, answering to each uniformity in nature which we can cognize, there must exist in us a belief of which the negation is inconceivable, and which is absolutely true. In this wide range of cases subjective inconceivableness must correspond to objective impossibility. Further experience will produce correspondence where it may not yet exist; and we may expect the correspondence to become ultimately complete. In nearly all cases this test of inconceivableness must be valid now; and where it is not, it still expresses the net result of our experience up to the present time; which is the most that any test can do."

True, — the most that any *empirical* test can do; but is not Mr. Spencer's test, "the universal postulate," exempt from this imperfection? If not, how does it warrant rejecting as impossible an inconceivable proposition, *on no other ground* than its inconceivableness? Mr. Spencer's argument, condensed and completed, is this. If there be any such things as universal necessary truths, then invariable beliefs must result from them; but we have invariable beliefs, therefore they must be the tests of truth! If A exists, then B exists; but B exists, therefore — Mr. Spencer must find the conclusion in his own logic: neither *Modus Ponens* nor *Modus Tollens* will serve.

"But," he continues, "the inconsistency into which Mr. Mill has thus fallen is most clearly seen in the second of his two chapters on 'Demonstration and Necessary Truths.' He admits in this the validity of proof by a *reductio ad absurdum*. Now what is a *reductio ad absurdum*, unless a reduction to inconceivableness? And why, if inconceivableness be in other cases an insufficient ground for rejecting a proposition as impossible, is it a sufficient ground in this case?"

After quoting other passages from Mill, Mr. Spencer says of them: —

"Here, and throughout the whole of his argument, Mr. Mill assumes that there is something more certain in a demonstration than in anything else, — some necessary truth in the steps of our reasoning which is not possessed by the axioms they start from. How can this assumption be justified? In each successive syllogism, the dependence of the conclusion upon its premises is a truth of which we have no other proof than the inconceivability of the negation. Unless our perception of logical truth is *a priori*, which Mr. Mill will not contend, it too, like our perceptions of mathematical truth, has been gained from experience," &c.

Now all this shows a grand confusion in Mr. Spencer's mind. He bases his postulate, the ultimate test of all truth, on two *hypotheses*, — the existence of universal facts or absolute uniformities in nature, and their effect in producing invariable beliefs in the mind; and because Mr. Mill allows these as *empirical* generalizations, he is regarded as inconsistent in not allowing the character of *necessity* to an imperfect conclusion from them! But Mr. Mill does not deny to natural beliefs a proximate or derivative authority. Both logical axioms and the axioms to which they are applied in reasoning may safely be taken as properly accredited from experience; but their authority is secondary, and such authority is not always to be trusted, as Mr. Mill's historical example shows. The imperfect argument, "If A, then B, but B," proves nothing absolutely, but it may determine a probability. Mr. Mill maintains that there are degrees of trustworthiness in natural beliefs, as well as in the so-called empirical beliefs, and that this trustworthiness depends absolutely, not on the strength of our beliefs, whether this be absolute or not, but on particular experiences, ultimately and absolutely.

Mr. Spencer endeavors to explain away Mill's historical example, — the fact that certain Greek philosophers could not credit the existence of antipodes, — by the consideration that the conception, which seemed impossible to these philosophers, is really a complex one, whereas the truths which are properly attested by the inconceivableness of their negations are simple "undecomposable" ones. He therefore puts a modifying clause into his canon. It is necessary that the ideas so tested be simple. The mind in the confusion of compound ideas may

think that it conceives what it really does not conceive, and that it cannot conceive what it really can conceive. The certainty of the application of the test depends on the number of really independent applications which it involves, in each of which the mind is liable to a slip of the attention. Mistakes from a confusion of matters are quite independent of the essential trustworthiness of our primary sources of knowledge. Even the senses may get confused. Why not, then, our invariable ideas? Easily: for does not Mr. Spencer himself confound the *authority* of our natural beliefs with their *utility* in directing us to what our *experiences* certify?

Mr. Spencer is mistaken in supposing that any middle ground is possible between empiricism and metaphysics, or that the characteristic ideas of these two philosophies can be reconciled by the hypothesis of organized experiences, anterior to the life of the individual mind. In these experiences, as in those of the individual life, particular facts are the real authorities, as is evinced by what Mr. Spencer cannot deny, that such facts are competent to overthrow the most settled beliefs. It avails nothing to say that such facts cannot be experienced, the mind being, *ex hypothesi*, unable to conceive them even if they exist; for this is to convict natural beliefs and the mind itself of incompetency, not to establish these beliefs as competent authorities.

In reviewing previous attempts to find an independent basis for Psychology, Mr. Spencer encounters Sir William Hamilton's philosophy of Common-Sense. After quoting Hamilton's leading maxims, that "Consciousness is to be presumed trustworthy until proved to be mendacious," and that "the mendacity of consciousness is proved, if its data immediately in themselves, or mediately in their necessary consequences, be shown to stand in mutual contradiction," he says:—

"Now a sceptic might very properly argue that this test is worthless. For as the steps by which consciousness is to be proved mendacious are themselves states of consciousness; and as they must be assumed trustworthy in the act of proving that consciousness is not so; the process results in assuming the trustworthiness of particular states of consciousness, to prove the mendacity of consciousness in general. Or to apply the test specifically:—Let it be shown that two data of consciousness

stand in contradiction. Then consciousness is mendacious. But if consciousness is mendacious, then the consciousness of this consciousness is mendacious. Then consciousness is trustworthy. And so on forever."

But the condition of vacillation to which Mr. Spencer reduces the sceptic's application of Hamilton's criterion is itself the true condition of scepticism. Mr. Spencer seems to mean by scepticism a dogmatic scepticism, — if we may be allowed the expression, — or a negative dogmatism; whereas Hamilton means by scepticism a negation of all philosophical judgments, the "what do I know?" condition of a mind confused about authorities; and Mr. Spencer has really given an excellent illustration of the application of these maxims, while seeking to depreciate their value. But the condition of scepticism is best illustrated by the original of the sophism to which he reduces Hamilton's maxims. "If you say that you lie, and say so truly, then you do lie; but if you say so falsely, then you speak the truth. In either case, therefore, the same statement is both true and false." To the fearful consequences of such lying is the sceptic reduced who doubts the testimony of consciousness. Mr. Spencer gives to this sophism the more common but inferior form, of which the original is this: "All Cretans are liars. But Epimenides, who says this, is himself a Cretan. Therefore, as he is a liar, this saying is not true. But if the saying is not true, Epimenides may have spoken the truth. Then the saying is true: — and so on as before." In his singular misapprehension of the meaning of the word "scepticism" in philosophy, Mr. Spencer illustrates another trait of his writings. He means by "sceptic" one who doubts the essential doctrines of orthodox philosophy, "natural realism," "personal identity," "the possibility of a science of psychology," and the like; and as he is opposed to such sceptics, he gives the impression to the world that he is ranged on the side of orthodoxy. But it is only with the husks of orthodoxy that he feeds his flock. He does not defend its doctrines as Hamilton did in the interests of dogmatic theology and religion, but simply from the vanity of disputation.

It cannot be said of Hamilton's criterion, that it is of any greater value than Mr. Spencer's, or that it yields anything

more as a principle of research, but it at least has the merits of self-consistency and distinctness.

In reviewing the objections to the test of inconceivableness, Mr. Spencer again finds himself opposed to Sir. William Hamilton. The doughty knight is encased in a seemingly invulnerable logic, and impedes the progress of truth. After stating certain minor and indecisive objections to the doctrine of the "conditioned," Mr. Spencer waives them.

"Granting all this," he says, "Sir William Hamilton's argument may still be met. He says that inconceivability is no criterion of impossibility. Why? Because of two propositions, one of which must be true; it proves both impossible, — it proves that space cannot have a limit, because a limit is inconceivable, and yet that it has a limit, because unlimited space is inconceivable; it proves, therefore, that space has a limit and has no limit, which is absurd. How absurd? Absurd because 'it is impossible for the same thing to be and not to be.' But how do we *know* that it is impossible for the same thing to be and not to be? What is our criterion of *this* impossibility? Can Sir William Hamilton assign any other than this same inconceivability? If not, his argument is self-destructive; seeing that he assumes the validity of the test in proving its invalidity."

This is the same shaft *ad hominem* which Mr. Spencer levelled at Mill, and it glances for the same reason. He does not precisely apprehend the position of his antagonist. Hamilton's argument is not self-destructive, since it is only designed to prove the incompleteness of the test, which Mr. Spencer has adopted in its baldest and crudest form. What was an obvious *petitio principii* as applied to Mr. Mill, namely, ascribing to him the opinion that logical axioms rest ultimately on the test of the inconceivableness of their negations, is none the less really such as applied to Hamilton's doctrines. Hamilton can and does assign a different criterion. Mr. Mill appeals to particular experiences as the tests, in the proper sense of that word, of all axioms logical or mathematical; while Hamilton admits for them a psychological test, analogous to Mr. Spencer's, yet more complete. "A proposition which can be conceived, but of which the negation cannot be conceived, is true, and its negation is false," is the complete formula.

The conceivable and inconceivable correspond to the possible

and impossible only when logically opposed to each other. If two conceivables *could* be logically opposed to each other, we should have scepticism in the philosophical sense of the word, or as Hamilton uses it. If two inconceivables are logically opposed, we have no test of true or false; yet not that vacillation of the mind, that uncertainty, which is the characteristic of scepticism. But we have the feeling that there is truth beyond the power of knowledge, or that "the domain of our knowledge is not coextensive with the horizon of our faith"; for a principle of truth—the principle of non-contradiction—is seen to extend where sense and imagination and our powers of conception cannot follow. This decides nothing positively. It only shows that unbelief or negative dogmatism is unfounded, and it opens the way for the authority of religious feeling, in whose behalf the contests of philosophy are undertaken by all but such pretended champions as Mr. Spencer. Hamilton went to the extremest verge in the direction of empiricism which it was possible to reach, without renouncing the interests for which philosophy proper has always been cultivated. Empiricism has other interests, worthy interests, but they are not religious.

It was necessary to a philosophical defence of religious doctrines to establish logical axioms on a broader basis than experience can afford, in order to secure a ground for belief in truths which are inconceivable, or truths of which the terms cannot be united in a judgment either by proofs from what is really known or by intuition; and in order also to reason about such truths, and bring the objects of religious feeling, partially at least, within the scope of our thoughts. Such are the motives for metaphysical philosophy, and such indeed are the only grounds for metaphysics. Philosophy converts practical reasons or final causes into theoretical reasons, and postulates a faculty where there is only a feeling. But after all, that which the Best in us most prizes is not so much the service of Philosophy as that for which this service is undertaken.

Mr. Spencer pursues his discussion of this subject in the first part of his recently published work, the "First Principles of a New System of Philosophy," to the consideration of which we shall presently come. Of his further developments in Psychology we can only say that they are very wearisome. He

makes little explicit use of his postulate; for this, after all, is only a license to take any ideas one chooses for the bases of science, if one only cannot conceive their negations. It is one of those unproductive principles which Positivism condemns; and he develops others equally useless, except in the mental discipline there may be in following their evolution. One such application of his method is in search of a definition of Life, which after a development in as many pages results in these words: "Life is defined as—The definite combination of heterogeneous changes, both simultaneous and successive, in correspondence with external coexistences and sequences." These are sufficiently abstract to be of some scientific service, but they only make Life the more perplexing, which had mysteries enough before. But we ought not to prejudice. Perhaps Mr. Spencer will be able, when he comes to treat of Morality in his new philosophy, to apply this definition to elucidating the principles of correct living.

But to return to the argument of his Social Statics. This is a thorough-going application of one of the conditions of human happiness to all the relations of human life, — namely, the Law of Liberty, or the "Let alone Principle." To warrant the exclusive application of this principle to the deduction of social laws and the limits of state powers, he postulates it as a part or one side of a perfect law, of which we have knowledge through a moral sense. This sense has not an *a priori* character, as the metaphysicians maintain, but is derived from the observation, by the human race as a whole, of the conditions essential to human happiness on the whole, and is developed in our nature with the evolution of civilization, as the instinct which cares for the interests of society just as the bodily appetites are produced to care for the interests of the individual organism. This doctrine is perfectly analogous to that which he develops more explicitly in the Principles of Psychology concerning the origin and character of natural beliefs. He makes the same mistake in basing a criterion on an hypothesis, and he is inconsistent in the same way in ascribing to his "moral sense" an original authority. With the exception of these errors, there is nothing in his doctrine of moral sense with which the utilitarian can find fault. But he develops his

ideas in this his earlier work so inexplicitly, that not only Mr. Mill,* but many others, have mistaken him for an opponent of utilitarianism. By ascribing an absolute authority to intellectual and moral ideas, when on his principles he ought only to have ascribed to them a relative and derivative one, he was led into mistakes which have given rise to misinterpretations of his doctrines, — misinterpretations of which he cannot justly complain. But he has also gained a reputation for orthodoxy, which he does not deserve.

Mr. Spencer succeeds better in his shorter essays, many of which for ingenuity, originality, and scientific interest have been rarely surpassed. Of his characteristics as a political writer, and of the general character of his attainments in science, we have already spoken. In a former article in this Review we pointed out sundry mistakes of a scientific character which he made in his essay on the Nebular Hypothesis. We shall have occasion to notice others in his more recent publications.

Judging only by his writings and the general character of his thinking, we should not ascribe to him that precision in the apprehension of scientific facts which comes chiefly from a successful cultivation of experimental and mathematical research in natural history and natural philosophy. To learn only the results of such researches and the general character of their processes is not enough. One must also be qualified to pursue them. The fact that Mr. Spencer was at one time a civil engineer seems to militate against this judgment of his qualifications. But though a marked success and a reputation acquired in this pursuit would be of great weight in determining our judgment, yet, in the absence of any evidence of this kind, we adhere to the opinion we have formed from his writings. We will say nothing of the impossibility of any one man's acquiring adequately all the knowledge requisite for the successful accomplishment of such an undertaking as Mr. Spencer has proposed for himself.

But a part of this work has become an accomplished fact. The "First Principles" of the new system of philosophy has appeared, and a serial publication of parts of another work on the "Principles of Biology" is now in progress. Mr. Spencer

* See Essay on Utilitarianism.

modestly omits from his gigantic scheme any special consideration of physics or the principles of inorganic nature ; although his training in mathematics and engineering would seem at first sight to be a preparation best suited to this subject. Perhaps he regards this science as standing in little need of his developments, and besides he has already published some of his views on this subject in his essay on the Nebular Hypothesis, and his *First Principles* involve generalizations from physical theories.

To the positivists the sciences of general physics, that is Astronomy, Mechanical and Chemical Physics, and Chemistry, afford the patterns for all the sciences, and some, like Physiology, are beginning to profit by such examples. But Mr. Spencer does not find in general physics free play for his ideas. It is only in what constitutes the problems and obscurities of these sciences that he finds free exemplifications of his principles. In the nebular hypothesis and in the obscure relations of physical forces to organic life, and in the hypothesis of the development of organic life through successive geological eras, he is at home. He is conscious of the temptation there is to impose teleological interpretations upon the obscurities of science ; and he therefore aims to free his speculations as much as possible from these biases, but with as little success as he had in his *Psychology* in correcting the errors of metaphysics by the light of empirical science.

The idea which has exercised the profoundest influence on the course of Mr. Spencer's thought, as well as on all thought in modern times, and one which appears more or less distinctly in nearly all of Mr. Spencer's writings, is the idea which he elaborates in his *First Principles* as the "Law of Evolution." But what is the origin and value of this idea ? Ostensibly it was derived from the investigations of the physiologists in embryology, from Harvey down to the present time. The formula of Von Baer was the first adequate statement of it. This formula Mr. Spencer has elaborated and completed, so as to apply, he thinks, not only to the phenomena of embryology, but to the phenomena of nature generally, and especially, as it appears, to those which we know least about, and to those which we only guess at.

But while this is the ostensible origin and scientific value of

this idea, its real origin is a very curious and instructive fact in human nature. Progress is a grand idea, — Universal Progress is a still grander idea. It strikes the key-note of modern civilization. Moral idealism is the religion of our times. What the ideas God, the One and the All, the Infinite First Cause, were to an earlier civilization, such are Progress and Universal Progress to the modern world, — a reflex of its moral ideas and feelings, and not a tradition. Men ever worship the Best, and the consciousness that the Best is attainable is the highest moral consciousness, the most inspiring of truths. And when indications of that attainment are visible not merely to the eye of faith, but in sensible progress, scientifically measurable, civilization is inspired with a new devotion. Faith that moral perfectibility is possible, not in remote times and places, not in the millennium, not in heaven, but in the furtherance of a present progress, is a faith which to possess in modern times does not make a man suspected of folly or fanaticism. He may forget the past, cease to be religious in the conventional sense of the word, but he is the modern prophet.

When Plato forsook the scientific studies of his youth, and found the truest interpretation of nature by asking his own mind what was the best, according to which, he felt sure, the order and framework of nature must be determined, he did but illustrate the influence which strongly impressed moral ideas have on speculative thought at all times; but he did it consciously and avowedly. Modern thinkers may be less conscious of this influence, may endeavor to suppress what consciousness they have of it, warned by the history of philosophy that teleological speculations are exploded follies; nevertheless, the influence surrounds and penetrates them like an atmosphere, unless they be moral phlegmatics and mere lookers-on.

It was Mr. Spencer's aim to free the law of evolution from all teleological implications, and to add such elements and limitations to its definition as should make it universally applicable to the movement of nature. Having done this, as he thinks, he arrives at the following definition: "Evolution is a change from an indefinite incoherent homogeneity to a definite coherent heterogeneity through continuous differentiations and integrations." But teleology is a subtle poison, and lurks

where least suspected. The facts of the sciences which Dr. Whewell calls palætiological, like the various branches of geology, and every actual concrete series of events which together form an object of interest to us, are apt, unless we are fully acquainted with the actual details through observation or by actual particular deductions from well-known particular facts and general laws, to fall into a dramatic procession in our imaginations. The mythic instinct slips into the place of the chronicles at every opportunity. All history is written on dramatic principles. All cosmological speculations are strictly teleological. We never can comprehend the whole of a concrete series of events. What arrests our attention in it is what constitutes the parts of an *order* either real or imaginary, and all merely imaginary orders are dramatic, or are determined by interests which are spontaneous in human life. Our speculations about what we have not really observed, to which we supply the order and most of the facts, are necessarily determined by some principle of order in our minds. Now the most general principle which we can have, included by all others, is this: that the concrete series shall be an intelligible series in its entirety, shall only interest and attract our thoughts and a rational curiosity.

But to suppose that such series exist anywhere but where observation and legitimate particular inferences from observation warrant the supposition, is to commit the same mistake which has given rise to teleological theories of nature. The "law of causation," the postulate of positive science, does not go to this extent. It does not suppose that there are throughout nature unbroken series in causation, forming in their entirety intelligible wholes, determinable in their beginnings, their progressions, and their ends, with a birth, a growth, a maturation, and a decay. It only presumes that the perhaps unintelligible wholes, both in the sequences and the coexistences of natural phenomena, are composed of intelligible elements; that chaos does not subsist at the heart of things; that the order in nature which is discernible vaguely even to the unobservant implies at least a precise *elementary* order, or fixed relations of antecedents and consequents in its ultimate parts and constituents; that the apparently irregular heterogeneous

masses, the concrete series of events, are crystalline in their substance.

To discover these elementary fixed relations of antecedents and consequents, is the work of scientific induction; and the only postulate of science is, that these relations are everywhere to be found. To account, as far as possible, for any concrete order, like that of life, intelligible as a whole, or regular, is the work of scientific explanation, by deductions from the elementary fixed relations which induction may have discovered. But to explain any such order by simply defining it externally in vague, abstract terms, and to postulate such orders as the components of nature and parts of one complete and intelligible order, is to take a step in advance of legitimate speculation, and a step backward in scientific method, — is to commit the mistake of the ancient philosophies of nature.

But Mr. Spencer thinks he has established his “Law of Evolution” by induction. The examples from which he has analyzed his law, the examples of progress in the development of the several elements of civilization, such as languages, laws, fashions, and ideas, — the hypothetical examples of the Nebular Hypothesis and the Development Hypothesis, and the example of embryological development (the only one our conceptions of which are not liable to be tainted by teleological biases), — are examples which, according to Mr. Spencer’s philosophy, afford both the definition and its justification. In other words, his definitions are only carefully elaborated general descriptions in abstract terms; or statements of facts which are observed in numerous instances or classes of instances, in terms detached from all objects, in abstract terms, of which the intension is fully known, but of which the extension is unknown except through the descriptions they embody. This, though a useful, is a precarious kind of induction, and is apt to lead to premature and false generalizations, or extensions of descriptions to what is hypothetical or unknown. Such inductions are liable to be mistaken for another sort, and to be regarded as not merely general, but universal descriptions, and as applicable to what they do not really apply to. This liability is strong just in proportion as prominence is given to such definitions in a philosophical system. No convert to Mr. Spencer’s philosophy

doubts the substantial correctness of the Nebular and Development Hypotheses, though these are only hypothetical examples of Mr. Spencer's law.

The other sort of inductions to which we have referred are peculiar to the exact inductive sciences. Facts which are not merely general, but, from their elementary character and their immediate relations to the orderliness of nature, are presumed to be universal facts, are the sort which the positive philosophy most prizes, and of which the law of gravitation is the typical example. The honor must be conceded to Mr. Spencer of having elaborated a precise and very abstract description of certain phenomena, the number, the other characters, and the extent of which are, however, unknown, but are all the more imposing from this circumstance.

The law of gravity was a key which deciphered a vast body of otherwise obscure phenomena, and (what is more to the purpose) was successfully applied to the solution of all the problems these phenomena presented. It is common to ascribe to Newton the merit of having discovered the law of gravity, in the same sense in which Mr. Spencer may be said to have discovered his law. The justness of this praise may well be doubted; for others had speculated and defined the law of gravity before Newton. What he really discovered was the *universality* of this law, or so nearly discovered it that the astronomers who completed the investigation did not hesitate to concede to him the full honor. He established for it such a degree of probability that his successors pursued the verification with unhesitating confidence, and still pursue it in the fulness of faith.

Mr. Spencer's law is founded on examples, of which only one class, the facts of embryology, are properly scientific. The others are still debated as to their real characters. Theories of society and of the character and origin of social progress, theories on the origins and the changes of organic forms, and theories on the origins and the causes of cosmical bodies and their arrangements, are all liable to the taint of teleological and cosmological conceptions,—to spring from the order which the mind imposes upon what it imperfectly observes, rather than from that which the objects, were they better known, would supply to the mind.

To us Mr. Spencer's speculation seems but the abstract statement of the cosmological conceptions, and that kind of orderliness which the human mind spontaneously supplies in the absence of facts sufficiently numerous and precise to justify sound scientific conclusions. Progress and development, when they mean more than a continuous proceeding, have a meaning suspiciously like what the moral and mythic instincts are inclined to, — something having a beginning, a middle, and an end, — an epic poem, a dramatic representation, a story, a cosmogony. It is not sufficient for the purposes of science that the idea of progress be freed from any reference to human happiness as an end. Teleology does not consist entirely of speculations having happy *dénouements*, save that the perfection or the end to which the progress tends is a happiness to the intellect that contemplates it in its evolution and beauty of orderliness. Plato's astronomical speculations were teleological in this artistic sense.

It is not sufficient for the purposes of science, that the idea of progress be thus purified ; and it would be better if science itself were purified of this idea, at least until proof of its extent and reality be borne in upon the mind by the irresistible force of a truly scientific induction. Aristotle exhibited the characteristics of scientific genius in no way more distinctly than in the rejection of this idea, and of all cosmological speculations.

But there is a truth implied in this idea, and an important one, — the truth, namely, that the proper objects of scientific research are all of them processes and the results of processes ; not the immutable natures which Plato sought for above a world of confusion and unreality, in the world of his own intelligence, but the immutable elements in the orders of all changes, the permanent relations of coexistences and sequences, which are hidden in the confusions of complex phenomena. Thought itself is a process and the mind a complex series of processes, the immutable elements of which must be discovered, not merely by introspection or by self-consciousness, but by the aid of physiological researches and by indirect observation. Everything out of the mind is a product, the result of some process. Nothing is exempt from change. Worlds are formed and dissipated. Races of organic beings grow up like their

constituent individual members, and disappear like these. Nothing shows a trace of an original, immutable nature, except the unchangeable laws of change. These point to no beginning and to no end in time, nor to any bounds in space. All indications to the contrary in the results of physical research are clearly traceable to imperfections in our present knowledge of all the laws of change, and to that disposition to cosmological speculations which still prevails even in science.

We propound these doctrines not as established ones, but as having a warrant from the general results of physical research similar to that which the postulate of science, the law of causation, has in the vaguely discerned order in nature, which forces itself on the attention even of the unobservant. But as a mind unfamiliar with science is easily persuaded that there are phenomena in nature to which the law of causation does not apply, phenomena intrinsically arbitrary and capricious, so even to those most familiar with our present knowledge of physical laws, but who have not attended to the implication of their general characters and relations, the supposition is not incredible that there is a tendency in the forces of nature to a permanent or persistently progressive change in the theatre of their operations, and to an ultimate cessation of all the particular conditions on which their manifestations depend. To show why this is incredible to us would carry us beyond the proper limits of our subject, were it not that our author has speculated in the same direction.

Having developed what he thinks to be the true scientific idea of progress in his "Law of Evolution," Mr. Spencer next considers its relations to ultimate scientific ideas, the ideas of space, time, matter, and force. As evolution is change, and as change, scientifically comprehended, is comprehended in terms of matter, motion, and force, and the conditions necessary to these, or time and space, it is necessary that evolution be further defined in its relations to these ideas. These are only formulating terms, entirely abstract. They imply no ontological theory about the nature or existence of mind or matter; and when Mr. Spencer proposes to formulate the phenomena of mind as well as those of matter in terms of matter, motion, and force, it is because these ideas are the only precise ones in which the phenomena of change can be defined.

Mr. Spencer is not a materialist. Materialism and spiritualism, or psychological idealism, are as dogmatic theories equally self-contradictory and absurd. Mr. Spencer is neither a materialist nor an idealist; neither theist, atheist, nor pantheist. All these doctrines are, he thinks, without sense or reason; and the philosophers who invented them, and the disciples who received and thought they understood them, were deceived. But we are inclined to the opinion that believers, though they may be deceived about their ability to comprehend these theories (for it is easy to mistake meanings), are not deceived about the motives or the spirit which prompts these speculations, and which in fact determines for each his election of what doctrine best suits his character. For within the pale of philosophy, character determines belief, and ideas stand for feelings. We receive the truths of science on compulsion. Nothing but ignorance is able to resist them. In philosophy we are free from every bias, except that of our own characters; and it therefore seems to us becoming in a philosopher, who is solicitous about the moral reputation of his doctrines, who would avoid classification under disreputable categories, that he teach nothing which he does not know, lest the direction of his inquiries be mistaken for that of his dispositions. The vulgar who use these obnoxious terms, materialism, atheism, pantheism, do not pretend to define them; but they somehow have a very definite idea, or at least a strong feeling, about the dangerous character of such speculations, which are none the less reprehensible because inconceivable.

But we must defer the consideration of the moral character of Mr. Spencer's speculations, until we have further examined their scientific grounds.

Terms which the real physicist knows how to use as the terms of mathematical formulas, and which were never even suspected of any heterodox tendencies, terms which have been of inestimable service both in formulating and finding out the secrets of nature, are appropriated by Mr. Spencer to the further elaboration of his vague definitions, and to the abstract description of as much in real nature as they may happen to apply to. As if an inventory of the tools of any craft were a proper account of its handiwork! Out of mathematical for-

mulas these terms lose their definiteness and their utility. They become corrupting and misleading ideas. They are none the less abstract, but they are less clear. They again clothe themselves in circumstance, though vaguely. They appeal to that indefinite consciousness which, as Mr. Spencer says, cannot be formulated, but in which he thinks we have an apprehension of cause and causal agencies.

“Though along with the extension of generalizations, and concomitant integrations of conceived causal agencies,” says Mr. Spencer, “the conceptions of causal agencies grow more indefinite; and though as they gradually coalesce into a universal causal agency they cease to be representable in thought, and are no longer supposed to be comprehensible, yet the consciousness of *cause* remains as dominant to the last as it was at first, and can never be got rid of. The consciousness of cause can be abolished only by abolishing consciousness itself.”

This is quoted by himself from his “First Principles,” as one of his “reasons for dissenting from the philosophy of M. Comte.” Though he seems solicitous to avoid all ontological implications in his use of scientific terms, yet we cannot avoid the impression of a vague metaphysical signification in his speculations, as if he were presenting all the parts of a system of materialism except the affirmative and negative copulas. These are withheld, because we cannot be supposed to believe anything inconceivable, as all ontological dogmas are. He seems to lead us on to the point of requiring our assent to a materialistic doctrine, and then lets us off on account of the infirmities of our minds; presenting materialism to our contemplation rather than to our understandings.

Mr. Spencer regards the ultimate ideas of science as unknowable; and in a sense the meanings of the abstractest terms are unknowable, that is, are not referable to any notions more abstract, nor susceptible of sensuous apprehension or representation as such. But the way to know them is to use them in mathematical formulas to express precisely what we do know. It is true that this cannot yet be done, except in the physical sciences proper, and not always with distinctness in these. It is only in astronomy and mechanical physics that these terms are used with mathematical precision. They change their meanings, or at least lose their definiteness, when we come to chemistry and physiology.

"The indestructibility of matter," "the continuity of motion," "the conservation of force," and "the correlation and equivalence of forces," are ideas which mathematical and physical science has rendered familiar. Beside these, Mr. Spencer has analyzed others, descriptive of the general external characteristics of motion; and he continues with a development of what the Law of Evolution implies. To all the ideas which he adopts from science he adds a new sense, or rather a vagueness, so as to make them descriptive of as much as possible. One of these ideas loses in the process so many of its original features, as well as its name, that we should not have recognized it as the same, but for Mr. Spencer's justification of what he regards as a change of nomenclature. He prefers "persistence of force" to "conservation of force," because the latter "implies a conservator and an act of conserving," and because "it does not imply the existence of the force before that particular manifestation of it with which we commence." Science, we are inclined to believe, will not adopt this emendation, because the conservation it refers to is that whereby the special conditions of the production of any mechanical effect in nature are themselves replaced by the changes through which this effect is manifested; so that if this effect ceases to appear as a motion, it nevertheless exists in the altered antecedents of motions, which may subsequently be developed in the course of natural changes. It is this conservation of the conditions of motion by the operations of nature through the strictest observation of certain mathematical laws, that science wishes to express. The objection (if there be any) to this phrase is in the word "force." This word is used in mathematical mechanics in three different senses, but fortunately they are distinct. They are not here fused together, as they are by Mr. Spencer, into one vague expression of what nobody in fact knows anything about. There is no danger of ambiguities arising from this source in mathematics. The ideas expressed by this word are perfectly distinct and definable. The liability to ambiguity is only when we pass from mathematical formulas to sciences, in which the word has more or less of vagueness and an ontological reference. This liability is somewhat diminished, at least so far as distinct mathematical comprehension is con-

cerned, by the use of the phrases, "conservation of mechanical effect" or "the law of power," which are now employed to express the mathematical theorem which has as one of its corollaries the doctrine that "perpetual motion" is impossible in the sense in which practical mechanics use the words. This theorem is deduced from the fundamental laws of motion, or those transcendental ideas and definitions which have received their proof or justification in their ability to clear up the confusions with which the movements of nature fall upon the senses and present themselves to the undisciplined understanding.

The phrase "conservation of force" was adopted from mathematical mechanics into chemical physics, with reference to the question of the possibility of "perpetual motion" by means of those natural forces with which chemistry deals. The impossibility of "perpetual motion," or the fact that "in the series of natural processes there is no circuit to be found by which mechanical force can be gained without a corresponding consumption," had been demonstrated only with reference to the so-called "fixed forces" of nature, or those which depend solely on the relative distances of bodies from each other. Chemical forces are not mathematically comprehended, and are therefore utterly unknown, save in their effects, and their laws are unknown, save in the observed invariable orders of these effects. These forces are merely hypotheses, and hypotheses which include little or nothing that is definite or profitable to research. But mechanical forces suggested to physicists a problem perfectly clear and definite. "Are the laws of chemical forces also inconsistent with 'perpetual motion'?" "Are light, heat, electricity, magnetism, and the force of chemical transformations, correlated with each other, and with mechanical motions and forces, as these are among themselves?" Here is something tangible; and the direction which these questions have given to physical researches in recent times mark out a distinct epoch in scientific progress. Here the answer could not be found *a priori*, as a consequent of any known or presumed universal laws of nature. Experiment must establish these presumptions; and it does so with such an overwhelming amount of evidence, that they are made the grounds of prediction, as the law of gravity was in the discovery of the

planet Uranus. Physicists have anticipated, on the ground of the impossibility of perpetual motion, such an apparently remote fact as this, "that the freezing temperature in water depends on the pressure to which the water is subjected." Experiment confirms this anticipation.

The processes of such researches are long and intricate, but they are perfectly precise and definite; and it is thus that the law of the "Conservation of Force" is made of value, and not by such use as Mr. Spencer is able to make of it, if indeed his "Persistence of Force" can be regarded as having any meaning in common with it. His principle seems to us to bear a much closer resemblance to the old metaphysical "Principle of Causality," or the impossibility of any change in the quantity of existence (whatever this may mean); and it also seems to us to be as profitless.

Having developed his Law of Evolution to maturity, he arrives at "Equilibration." All evolutions must have an end, and this end is "Equilibration." Then there is no longer any tendency to "a definite, coherent heterogeneity, through continuous differentiations and integrations." Life is balanced. The worlds are completed.

Throughout this speculation the mechanical arguments of the Nebular Hypothesis have been the guides to Mr. Spencer's abstractions, while the doctrines of embryology have furnished the terminology. Recent developments of this hypothesis in connection with the theory of the correlations of mechanical forces and heat, have afforded him a splendid opportunity to carry out and illustrate his theories, and this opportunity Mr. Spencer has not neglected. Fully convinced of the truth of the Nebular Hypothesis, as well as of the importance of his own Law of Evolution, he reasons with the earnestness of conviction and with the blindness of zeal; and he brings to bear upon his theories the intense interest which the recent developments of physics are calculated to awaken concerning certain problems in astronomy. The source of the sun's heat, the origins of the planets and their motions in the solar system, the past and future histories of the earth and of the universe,—all these topics have an interest outside of science. They appeal to the story-loving, mythic instinct which willingly helps Science over

her difficulties and uncertainties. It is desirable on this account to distinguish as far as possible between what is demonstrative or scientifically probable, and what is imaginary or poetically probable, in theories on these subjects. To do this adequately is the work of time, patience, and science, following the methods of experimental philosophy rather than those of Mr. Spencer. We can now present only the elements of these problems, with the impressions which come from an *a priori* distrust of cosmological speculations.

The discovery of the constant relation of mechanical effect and heat, and the determination of the measures by which this relation can be mathematically expressed in an equation, gave at once, by a simple computation with well-known astronomical data, results of the most surprising and interesting character. The mere motions of bodies, such as they have in the spaces of the solar system, and such as the sun is able to produce in bodies falling to it and in the masses of which it is composed through their mutual attractions, were found to represent vastly greater quantities of heat than could be produced by any known chemical agency, like combustion, with the same quantity of matter of whatever kind. Here then was the long sought for origin of the sun's heat. If the motions continually produced and arrested in the contractions of the sun's mass, incident to its cooling, should only amount to what would diminish the sun's diameter by one part in twenty millions in a year, it would be sufficient to produce all the enormous amount of heat which the sun has been proved to radiate in that time. If a body falling from a height not greater than the known limits of the solar system should have the motion it would thus acquire arrested and dissipated in the form of heat in the mass of the sun, it would also produce this amount of heat, provided the mass of the body be to that of the sun only as one to thirty millions. At least one half of the energy represented by this heat would be acquired in that part of the fall between the surface of the sun and a height not greater than the distance of this surface from the centre; and if the body should have fallen from the greatest supposable height, all but about one in six thousand parts of this energy would have been acquired within the known limits of the solar system, and all but about one in two

hundred parts within the limits of the earth's orbit. To explain the origin of the sun's heat, two theories have, therefore, been advanced. One in accordance with the Nebular Hypothesis explains it as arising from the falling in upon itself of the matter which composes the mass of the sun and an arrest of this motion resulting in heat and a continuous contraction of the sun's diameter, but without any change in the sun's mass. The other, on the evidence there is of the existence of innumerable small bodies moving in irregular and eccentric orbits through the spaces of the solar system, supposes the frequent fall of such bodies to the sun, and the arrest of their motions in its mass, as the origin of its heat.

What shall decide between these two theories? At first sight, the fact that the mass of the sun does not change so fast as the second theory appears to require, as is evinced by the fact that there is not a corresponding change in the attractive energy of the sun, and in the resultant periods of revolution in the earth and other planets, seems to refute this theory, and to decide in favor of the first. On the other hand, the second theory appeals to its foundation in independently probable evidence which the first does not possess, and to another theoretical consideration which explains away this difficulty, namely, the consideration that only one half of the problem has yet been attended to; for on either hypothesis we should explain, not only how the sun's heat is produced, but also what becomes of the mechanical energy which this heat represents.

Dr. Mayer, who advances the second or the meteoric hypothesis, is content to affirm that the matter of the sun is dissipated also, as well as its heat, through the agency of its heat; so that its mass remains sensibly constant. This additional hypothesis has in itself about the same character which the Nebular Hypothesis possesses. So far, therefore, the two explanations are balanced. Both explain the origin of the sun's heat and the constancy of its mass by the union of facts independently probable with an hypothesis made for the purpose of explanation but not inconsistent with observed facts. The one theory adopts the hypothetical contraction of the sun's diameter, which observation has been unable to test, with the observed fact that the sun's mass does not increase so much as the other theory

seems to require. And the other theory avoids this requirement by the hypothesis of the dissipation of the matter of the sun, united with the independently probable fact that bodies are continually falling to the sun's surface, just as they are continually falling to that of the earth, only in vastly greater numbers.

It is enough to say of the Nebular Hypothesis, that no physicist of repute regards it as having that degree of independent probability which warrants its use as a ground of probable prediction, or as affording a justification of any new or implied hypothesis. But the uncertainty as to which of the two mechanical theories of the origin of the sun's heat is true, should not for a moment be compared to the uncertainty of the Nebular Hypothesis. For it is almost certain that either one or the other is the true explanation; and, indeed, they are not essentially inconsistent with each other. Both may be true; or rather a third theory, combining both, may have a probability superior to that of either. If it be true that the sun is a body at a minimum of temperature, which on account of its enormous mass and attractive energy is able, through the contractions due to its loss of heat, to make compensation for its radiations at the expense of its dimensions, then it follows that this temperature is also a maximum one, and that an increase of the total heat of the sun by the fall of bodies to it will not increase its temperature, but rather its dimensions; its temperature being kept uniform, much as the energies and impulsions of an engine are reduced to uniformity by the inertia of its fly-wheel and that of the bodies on the resistances of which its energies are expended.

But on what are the energies of the sun expended? What becomes of its radiations? Mr. Spencer speaks in his vague way and in his dialect of the mechanical processes of the solar system as constituting "Evolution where there is a predominant integration of Matter and disintegration of Motion." He regards the laws of change as causes of "Dissolution where there is a predominant integration of Motion and disintegration of Matter." What in the language of physics does all this mean? We suppose it means that the parts of a body or a system of bodies are brought nearer each other on the whole

by a loss of internal motions, whether these be in the form of heat or of massive motions ; and that a system or a body is expanded on the whole by an addition to its internal motions or the relative motions of its parts. These are important mechanical theorems, but their deduction and extension by generalization necessitates the scholium, that all such "Evolutions" are attended by corresponding "Dissolutions." Motion is the motion of something, though Mr. Spencer seems to speak of it as capable of existing by itself. Motion may grow less or cease in a body or a system without being lost from it, but in this case it is represented by an expansion of the body or the system. The motions of the solar system are continually varying, becoming greater or less according as the bodies of the system are approaching or receding from each other on the whole. But motions really lost from one body or system of bodies are taken up by others, and those which are really gained are acquired from others. This is so universally true, that it includes the motions of living as well as of so-called dead matter. The motions of heat and of mechanical energy in the living body are necessarily derived from the motions and antecedent special conditions of motion which are contained in the sunbeam and in the food through which the living bodies of plants and animals are formed. But while in these bodies, during their growths and throughout their lifetimes, there is a well-marked order and harmony in such changes, the definitions of which are the proper definitions of life, yet such an order is not necessarily implied in the universal laws of change. All that is necessarily implied in these is balance and ultimate compensations,—compensations in times and spaces, which are wholly indefinite, and in concrete series of phenomena, which may or may not be simple orders or intelligible as wholes, but over which it is certain an elementary order reigns supreme.

The principle of the conservation of mechanical energy in and through the operations by which it is manifested, is the expression of this elementary order, from which, however, nothing can be deduced *a priori* in regard to any class or concrete series of phenomena in nature. The positions of the planets are deducible *a posteriori* from a sufficient number of particular facts in *this* concrete series, and by means of elemen-

tary laws. But while such successions as life exhibits involve the law of the conservation of force, so far as they involve any changes in matter, yet no characteristic features in such successions are deducible from this law, notwithstanding Mr. Spencer's asserted demonstrations of the contrary. Life must still be studied from without. Its principle is not yet discovered.

Concentrations of matter with a transfer of its internal motions to other matter, and separations of matter by motions received from without, are both exemplified in growth. Mr. Spencer calls the first "Evolution," but the growth of plants is really characterized by the second; for though there is a concentration of carbon in the tissues of the plant, yet the mechanical operation by which this is effected is really a separation of the carbon from oxygen by the mechanical energy of the sunbeam, which, coming in from without, overcomes the forces of chemical aggregation in carbonic acid. There is here an aggregation of matter so far as mass or weight is concerned, but none so far as the *chemical* forces are concerned. In respect to these forces, vegetation is a dispersion of matter through an accession of forces; and combustion or consumption as food in animal bodies is a dispersion of forces with a concentration of matter, though so far as mass or weight is concerned this matter is also dispersed in the form of carbonic acid gas.

Dispersion and concentration are not to be mechanically measured by mere distances in space, even in the case of gravitation; for, as we have said, a body falling from the limits of the solar system acquires on reaching the surface of the sun all but one in six thousand parts of the energy which it could acquire in falling from the height of the remotest star. The immense distances by which the stars are separated from each other is not, therefore, the representant of a much greater energy than that which the dimensions of the solar system represent, though these become as nothing in respect to mere distances. Gravitation is a feeble force except in close proximity, and there is some degree of probability in the speculation which regards it as really a resultant of the forces to which it seems to give rise. Whether this speculation be true or not,

there is no evidence that the law of gravity is exact, or more than approximately true, or that the force of gravity subsists at all between the remotest stars. That it plays but an insignificant part in determining the distributions and motions of stars and systems of stars is highly probable, since these are but imperfectly accounted for, if at all, by its law. The motions of the closely proximate members of binary stars are in fact the only ones in sidereal astronomy which have been brought under the law of gravity. Still it would be contrary to the postulate of science, or to any sound principle of philosophizing, to regard the distribution of the stars as in any absolute sense fortuitous; for in this also, as in nature generally, there is that vaguely discerned order which warrants the postulate of science, and its efforts to decipher what it has a right to presume, namely, at least an elementary order.

We hold the opinion that the mechanical theory of heat, when it comes to be applied in earnest to the problems of dynamics in sidereal astronomy, will be rewarded with triumphs not inferior to those which the law of gravitation has achieved in the solar system; and that the distribution of the stars will be accounted for, not on the hypothesis of simple attractive or repulsive forces, but by the distributions of matter and heat through the interstellar spaces, and by their actions and reactions, not as centres of simple forces, but as the receptacles of concrete masses and motions, and as the sources of diffused motions and matters, none of which can ever be lost or destroyed; that their motions will be found to result principally from those of the medium of diffused materials, from which they are aggregated precipitates, and into which they are evaporated by heat.

This is at present only an hypothesis, but it is not teleological in any sense of the term. The most obvious objection to it is the theory that there is "a universal tendency in nature to the dissipation of mechanical energy," a theory well founded, nay, demonstrated,* if we only follow this energy as far as the present limits of science extend. But to a true Aristotelian this theory, so far from suggesting a dramatic *dénouement*,

* By Professor William Thomson.

such as the ultimate death of nature, only propounds new problems. What becomes of the sun's dynamic energy, and whence do the bodies come which support this wasting power?

The earth is composed of masses mechanically as well as chemically heterogeneous. The forces of chemical aggregation overcome this confusion to a limited extent, through the agency of internal heat and aqueous solution, in the formation of metallic deposits and crystalline segregations, but only to a limited extent. Long persistent mechanical actions of air and water, and vegetal aggregations, produce a similar mechanical homogeneity in geological deposits. Still the materials of the earth's surface exist as if they had been thrown together without any determinable order,—as if the earth and similar bodies had been compounded of the materials of smaller masses falling together, and gradually wrought by geological forces into the little order they present. Materials continue to arrive at the earth's surface,—in how great quantities it is at present impossible to form a trustworthy estimate. Are not all large bodies so formed? But how are the smaller bodies formed? The comets, which are more numerous “in the heavens than fish in the ocean,” and the meteors, more numerous than the sands of the desert,—how are they formed? Our answer is an hypothesis. They are formed by chemical and mechanical aggregation from matters diffused throughout space by the mechanical energy of the sun; and by their fall they restore this energy. This would complete the round of nature, but the theory is not thereby demonstrated. Scientific demonstration is slow and painful, the work of time and patience. All that can now be presented are problems, but these are scientific problems. They are about the details of an elementary order, which science has a right to presume, and not about the abstract features of an external order, which science has no right to presume.

Following the publication of his “First Principles,” there appeared a short essay by Mr. Spencer on “The Classification of the Sciences”; to which are added his “Reasons for dissenting from the Philosophy of M. Comte.” We had a little hope that here at least Mr. Spencer's reputation for philosophical analysis, and for an extensive knowledge of the sciences, would stand

proof, and be confirmed by a valuable result. Instead of this, we find nothing deserving attention from any one who does not find in his "First Principles" the germs of a great philosophy, except bad criticism, a perverted terminology, and fanciful discriminations.

Nearly all philosophers are agreed, we believe, in assigning logic and mathematics to a distinct division of the sciences, and these have with great propriety been denominated formal sciences, as distinguished from the real or material sciences. This propriety is quite independent of any metaphysical or critical theory which we may have about the origin or intrinsic character of mathematical and logical truth. Whether we regard the truths of formal science as really universal or not, their *presumed* universality is what determines their peculiar character and functions in science generally. But Mr. Spencer seems more solicitous to avoid an implication of a metaphysical doctrine, which these terms have, than to avail himself of their real scientific utility; and he uses, instead of them, the ambiguous and otherwise objectionable terms "abstract" and "concrete," and is obliged, consequently, to define and defend these in the sense in which he proposes to use them. Truths that have exemplification in nearly every class of facts of which we have precise knowledge, the axioms and postulates of which are implied, indeed, in all knowledge, may relatively to all other truths be properly regarded as *a priori* and formal, or as the moulds into which these truths are cast. It may be, as Mr. Spencer thinks, that these truths are obtained by abstraction alone, from our experience of things; nevertheless, to make any reference in a classification to this circumstance is to sacrifice the proper objects of a classification to an extrinsic object, and is also open to the objection which seems to have prevailed with him, though he makes no explicit reference to it, against the more generally received terms "formal" and "material." "Formal" implies precisely what Mr. Spencer means by *wholly* abstract, and "material" what he means by *wholly* concrete; but he uses the unqualified terms "abstract" and "concrete" in these extreme senses. He gets confused about the distinction of "abstract" and "general," and thinks M. Comte and M. Littré have confounded them.

According to the most authentic usage, "abstract" and "general," though not the same, are not antithetical, as Mr. Spencer would have them to be. He says: "Abstractness means *detachment from* the incidents of particular cases. Generality means *manifestation in* numerous cases." *Total* detachment he means, for he uses "abstract" and "concrete" as exclusive contraries. In this use, however, Mr. Spencer is not alone; for the character of the process of abstraction, says Sir William Hamilton, has "been overlooked by philosophers, insomuch that they have opposed the terms *concrete* and *abstract* as exclusive contraries." But no philosopher before Mr. Spencer has attempted to establish any opposition between "abstract" and "general"; for though the "abstract" does not imply generality, yet generality is dependent on abstraction. "*Manifestation in numerous cases*?" is the manifestation of what?—we would inquire of Mr. Spencer. Of anything but what must be obtained by abstraction? And yet he claims that his use of the words "abstract," "concrete," and "general" is the correct one. M. Littré's definition of abstractness as "subjective generality," does not appear to us a very happy one, but it is vastly superior to his critic's definitions.

In designating by the terms "abstract," "abstract-concrete," and "concrete" the divisions of the sciences which the words "formal," "mixed," and "material" have hitherto denoted, Mr. Spencer has only confused a subject already possessed of an adequately precise nomenclature. The *presumed* universality of mathematical and logical truth, the entirely empirical generality of merely descriptive sciences, and the union of these kinds of truth in general physics, are properly connoted by the terms already in use.

In Mr. Spencer's subdivisions of mathematics he has given a prominence to "Descriptive Geometry" which might be regarded as arising from the partiality of the civil engineer for a branch of his own art, were it not that he says:—

"I was ignorant of the existence of this as a separate division of mathematics, until it was described to me by Mr. Hirst, whom I have also to thank for pointing out the omission of the subdivision 'Kinematics.' It was only when seeking to affiliate and define 'Descriptive Geometry' that I reached the conclusion that there is a negatively-

quantitative mathematics, as well as a positively-quantitative mathematics. In explanation of the term negatively-quantitative, it will suffice to instance the proposition that certain three lines will meet in a point, as a negatively-quantitative proposition ; since it asserts the absence of any quantity of space between their intersections. Similarly, the assertion that certain three points will always fall in a straight line is negatively-quantitative ; since the conception of a straight line implies the negation of any lateral quantity or deviation."

The propositions selected by Mr. Spencer to illustrate what he calls "Descriptive Geometry" are by no means peculiar to or characteristic of the art to which mathematicians have given this name. In the most elaborate and extensive treatises no more is claimed for this art than that it is an account in a scientific order of certain methods of geometrical construction, useful in engineering and architecture, but inferior in scientific extension even to trigonometry, to which Mr. Spencer does not deign to descend. It is possible that Mr. Spencer has in mind certain propositions in the "Higher Geometry" concerning relations of position and direction in points and lines ; but these cannot be made to stand alone or independently of dimensional properties, and if they could, they would be as appropriately named "qualitative" mathematics as "negatively-quantitative." In short, this is the most flagrant application of "the principle of contraries" in classification which has ever come to our notice. If Mr. Spencer proposes to select from mathematics all positively-quantitative problems and propositions for one branch, and all negatively-quantitative ones for the other, he must reconstruct, if he can, the whole science, and the question of terminology will only be a question between him and his brothers in his own craft.

His subdivisions of the "concrete" and "abstract-concrete" sciences are an application of his "First Principles," concerning the character of which we have already spoken.

We treated first in order of the second part of Mr. Spencer's "First Principles," which comprises his "Laws of the Knowable," reserving for our concluding paragraphs the consideration of his doctrine of "the Unknowable," and his position before the religious world.

This position has been greatly misunderstood, and Mr. Spen-

cer himself has contributed much to the misunderstanding. He has appeared as a champion for what is sound in the older philosophy, and one of his avowed objects is to reconcile the truths of religion with those of science. He is anxious not to be thought a positivist, and he publishes as an appendix to his "First Principles" a response to his reviewer in the *Revue des Deux Mondes*, to show that he is not a positivist or a follower of M. Comte.

It requires only a little thoughtful attention to the speculations of Mr. Spencer and M. Comte to see that they are radically unlike, not only in the details of doctrine, but in their ostensible aims. The religious world, however, though perhaps a little too trusting and a little dull of thought, has very acute feelings, and a fine sagacity in apprehending the religious drift of a system of philosophy. It began to have suspicions, but it was, nevertheless, anxious to see the truths of science reconciled with those of religion, and so it has continued to listen to Mr. Spencer.

There can be no doubt of the earnestness and moral honesty of Mr. Spencer's writings. He is conscious of a generous purpose, and is actuated by the modern form of religious sentiment, moral idealism, or a belief in the moral perfectibility of things in general. He only lacks a distinct consciousness of his exact position with reference to older forms of religious sentiment. He imagines that his philosophy can conciliate these also. This conciliation is effected, he thinks, by presenting the unknowable as a subject of contemplation, — the abstract unknowable, not an entity or a subject for propositions and beliefs. Beliefs about the unknowable are absurd, thinks Mr. Spencer. It is only in the existence of the unknowable as implied in the existence and limits of the knowable that we can believe, and this becomes more and more distinct as the knowable becomes more distinct in its conditions and limits.

"Thus the consciousness of an Inscrutable Power manifested to us through all phenomena has been growing ever clearer, and must eventually be freed from its imperfections. The certainty that on the one hand such a Power exists, while on the other hand its nature transcends intuition and is beyond imagination, is the certainty towards which intelligence has from the first been progressing. To this conclusion science inevi-

tably arrives as it reaches its confines ; while to this conclusion religion is irresistibly driven by criticism. And satisfying as it does the demands of the most rigorous logic at the same time that it gives the religious sentiment the widest possible sphere of action, it is the conclusion we are bound to accept without reserve or qualification.

“Some do indeed allege that though the Ultimate Cause of things cannot really be thought of by us as having specified attributes, it is yet incumbent upon us to assert these attributes. Though the forms of our consciousness are such that the Absolute cannot in any manner or degree be brought within them, we are nevertheless told that we must represent the Absolute to ourselves under these forms. As writes Mr. Mansel in the work from which I have already quoted largely, ‘It is our duty then to think of God as personal ; and it is our duty to believe that he is infinite.’

“That this is not the conclusion here adopted needs hardly be said. If there be any meaning in the foregoing arguments, duty requires us neither to affirm nor deny personality. Our duty is to submit ourselves with all humility to the established limits of our intelligence, and not perversely to rebel against them. Let those who can believe that there is eternal war set between our intellectual faculties and our moral obligations. I for one admit no such radical vice in the constitution of things.

“This, which to most will seem an essentially irreligious position, is an essentially religious one, — nay, is *the* religious one to which, as already shown, all others are but approximations.”

We are inclined to think, nevertheless, that the older forms of religious sentiment, instead of being satisfied with this, and in place of a better reconciliation, if none appears, will resort rather to formularies and the fine arts. Religious sentiments are essentially constructive. They must have propositions, or something to believe, — something to give entire, free, and hearty assent to. Strings of abstract incomprehensible terms, with the copulas all left out, — nothing to believe in except our own ignorance (however respectable this may be), — will never do. If thought cannot furnish the copulas, feeling can and will.

But, seriously, we must repeat that the philosophy of Sir William Hamilton went to the extremest verge in the direction of empiricism which it was possible to reach without renouncing the interests for which philosophy had always been cultivated. Empiricism has other interests, worthy ones, but they

are not religious. Hamilton's doctrine aimed only at this,—to show that unbelief or negative dogmatism was unfounded, and to open the way for the authority of religious feeling.

Mr. Mansel, correctly apprehending the drift of Sir William Hamilton's doctrine, elaborated it still further, and supplied what was wanting to make it a religious philosophy, namely, the authority of religious feeling; but it was the authority of the religious feelings of his own sect, of course. This movement, apparently in behalf of the Established Church, roused great opposition to the doctrines of Hamilton on the part of dissenting theologians. They attacked what had been before called in question, the empirical doctrines to which, while admitting and defending them theoretically, Hamilton opposed what is peculiarly his own philosophy, as a practical defence of religion. But any other sectarians were just as competent to supply the defects of Hamilton's philosophy as Mr. Mansel. They had only to advance the authority of *their* religious feelings into the vacant place. Controversy would have gone on just as before. Only the irreligious would have been excluded from the field. But the vacant place was historically preoccupied by Mr. Mansel, and it was thought necessary by the others to carry the whole position.

Thus religious controversy blinded both the friends and the foes of religious philosophy in regard to the true scope and position of Sir William Hamilton's doctrine. He has come to be regarded by both parties as the great modern champion of philosophical empiricism, whereas he only quoted it against Cousin and the German rationalists, and proposed as his own contribution to philosophy that which is regarded by Mr. Spencer as a defect and an inconsistency in his philosophy.

"The Conditioned," says Hamilton, "is a mean between two extremes, two inconditionates, exclusive of each other, neither of which *can be conceived as possible*, but of which, on the principles of contradiction and excluded middle, one must be admitted as *necessary*. On this opinion, therefore, reason is shown to be weak, but not deceitful. The mind is not represented as conceiving two propositions subversive of each other as equally possible; but only as unable to understand as possible either of two extremes, one of which, however, on the ground of their mutual repugnance, it is compelled to recognize as true. We are

thus taught the salutary lesson, that the capacity of thought is not to be constituted into the measure of existence; and are warned from recognizing the domain of our knowledge as necessarily coextensive with the horizon of our faith. And by a wonderful revelation we are thus, in the very consciousness of our inability to conceive aught above the relative and finite, inspired with a belief in the existence of something unconditioned beyond the sphere of all comprehensible reality."

Of this passage, in which Sir William Hamilton first stated his own peculiar doctrine, though less clearly than in his subsequent writings, Mr. Spencer says:—

"By the laws of thought, as Sir William Hamilton has interpreted them, he finds himself forced to the conclusion, that our consciousness of the absolute is a pure negation. He nevertheless finds that there does exist in consciousness an irresistible conviction of the real 'existence of something unconditioned.' And he gets over the inconsistency by speaking of this conviction as a 'wonderful revelation,' 'a belief' with which we are 'inspired'; thus apparently hinting that it is supernaturally at variance with the laws of thought. [!] Mr. Mansel is betrayed into a like inconsistency,"—

which Mr. Spencer proceeds to point out.

Strange inconsistency indeed, if it be true, between that which is mistaken by his critic as the essence of his philosophy, and that which, being the real essence, is regarded as an inconsistency. Supposing Sir William Hamilton and Mr. Mansel are really arguing in the interests of empiricism, he tries to help them out, and supply another proof of "the relativity of all knowledge"; yet he finds in some of the statements of his friends an implication of "a grave error." He thinks they deny by implication that we can "rationally affirm the positive existence of anything beyond phenomena"; whereas what they are all along trying to prove is, that we *can* rationally affirm what we cannot positively conceive or construe to thought. This includes what Mr. Spencer calls "the incomplete thoughts of an indefinite consciousness," and more. It even signifies that we can and do rationally affirm not only what is incompletely thought of, but that of which we can only think the meanings, or the relations of the terms by which it is expressed.

Mr. Spencer believes that we have an indefinite consciousness of the Absolute and of Cause, but not one which will war-

rant any other proposition than that which is implied in this consciousness, namely, that it is not distinct. That we can be distinctly ignorant is the highest religious truth he has to offer. In setting forth this his contribution to religious philosophy, he characterizes the argument of his predecessors thus : —

“Truly to realize in thought any one of the propositions of which the argument consists, the unconditioned must be represented as positive, not negative. How then can it be a legitimate conclusion from the argument, that our consciousness of it is negative? An argument, the very construction of which assigns to a certain term a certain meaning, but which ends in showing that this term has no such meaning, is simply an elaborate suicide.”

But really the argument of which Mr. Spencer has proved his total misapprehension is not an argument about meanings at all, but about the supposed objects of thought which the terms of the argument denote. To conceive the meaning of a proposition and to conceive the proposition itself, or to conceive the fact which the proposition expresses, are not the same ; though in confounding them Mr. Spencer does not stand alone. The question is about the mind's ability, right, or duty to believe what, as stated in a proposition, is stated in terms which, while their meanings are clear, cannot be united in a judgment, either by proof from what is truly known, or by intuition. If two such propositions stand in mutual contradiction, says Sir William Hamilton, one of them must be true, or the laws of thought are false ; and he offers the alternative of absolute or philosophical scepticism, a suspension of all judgments, or a belief in something inconceivable. He offers it of course only formally ; for a decision in favor of scepticism is self-contradictory, a judgment that all judgments are false, which ends in that painful uncertainty exhibited in the sophism of the liar, to which we referred in treating of Mr. Spencer's *Psychology*. The choice between having judgments and having none is, of course, only a paradoxical mode of presenting the absurdity which cannot really be committed, but which is implied in certain confusions of thought. It was to remove these confusions by clear philosophical statements, and not to prove anything, that Hamilton's doctrine of the conditioned was propounded.

We have now completed our survey of the principal philosophical works of Mr. Spencer, a writer whose pretensions aim at a system of truth which shall formulate all legitimate human knowledge, but whose performance of the part he has undertaken gives little hope of success in what yet remains to do.

The number of topics which we have been led to consider in this survey illustrates the versatility of our author, and the number in regard to which we have been compelled to deny his conclusions illustrates his incompetency for the further development of his encyclopedic abstractions.

ART. V. — *Inaugural Message of Governor THOMAS C. FLETCHER, to the Twenty-third General Assembly of the State of Missouri. In Session January 2, 1865. Jefferson City. 1865. 8vo. pp. 14.*

THIS day (we write on the 11th of January, 1865) a great State, the magnificent home of millions yet to be, emerges from the long shadow. The curse laid on her forty-four years ago has been lifted. The chain has been broken that bound the strength of the earth and the soul of man throughout the vast domain of Missouri. For this day, at ten minutes before three, P. M., in the State Convention in the city of St. Louis, an ordinance was passed, declaring all persons held as slaves in the State of Missouri free, and henceforth slavery in her borders forever abolished.

In vastness of natural resources so mingled as to minister to the development of a rich, energetic, and multiform civilization, Missouri is unequalled amid the Western States. Her omnigenous soils are capable of producing all the growths that belong to her latitude which may serve man's necessities or luxuries, his comfort, convenience, or pride. Picturesque with contrasts of surface and feature, with pleasing change of hill, meadow, table-land, river-basin, grove, and prairie, she is unrivalled in her variety of natural beauty. Nor is